

DRAGON USER



The independent Dragon magazine

95p

US\$3.25

May 1988

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hidden depths**

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HELLO and welcome to a slightly off-beat newsletter like Oswald's. Advertisers that find out all who are (I hope) I am writing under the name of The Expert? Why an arcade delirium? Why are there so many harmful additives in our foods? Important questions one and all are they not?

Firstly I am the undoubted (due to the fact that I am not going to throw it open to Oswald) champion of Dragon arcade games in Britain.

Yes I am the Person who has got past that annoying line in *Copie Stretch* that goes up and down! I am the Person who can do every screen on *Missile Moon* (also knows where they all are on *Jet Set Willy*) I can get into the *Microbots* on *Atari*. The *Ball* with power surge! I can even understand the instructions to *Lozan Zoni*!

The reason for this columnist's existence? Well the Dragon User office was contacted with letters demanding an arcade column and we give what the public wants with a little help from you. Well I need

more you are the maps of the games you've played (is full Jet-Set Willy map would be nice)

Prices for the lives and the speed, and whatever else you know on any arcade game (except for the sake of collection as any game that doesn't require complete thought to play is single game) also are they you have.

Thanks go out to Peter Himmang for starting the ball rolling with a collection of hints. Says Peter:

I made that some Dragon User readers will be interested in the following cheat routines:
1) *FOR* 11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-122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Operation Code

Your first helping code — explained step-by-step by Orbaum and Campbell.

AFTER last month's gentle introduction to the art of assembler programming, we are going to get down to some serious brain damage this issue with a small program (as promised last month), and a look through the simpler mnemonics (the lines of code that you and I can understand, rather than the numbers that are fed to the processor).

First, for those who prefer a slightly more coherent approach to the subject, a somewhat small bibliography. We have only some copies (the book only available for the 6800, and that is "Programming The 6800" by Rodney Zakariel Wilson Lileak, published by Sybex (ISBN No. 0-89585-078-4). For the more advanced assembler programmer (what are you reading this for?) the Motorola specification sheet is probably worth a look, although we have never been able to get a copy.

The program listed this month is the clear screen routine mentioned in last month's

article. The format of the listing, working from left to right, is:

Address — In hexadecimal (for here, this is base sixteen numerology — explanation is a later article) the address of the first byte of the instruction.

Instruction Operation Code — Generally known as the OP Code, as this is less of a meaningful description in this. This is part of what is passed to the processor to be interpreted.

Operand — Data for use by the processor — varies depending on the instruction.

Line Number — From the Crosser editor purely decorative.

Label — May be the line number in BASIC used as a reference for jumps and sub-routine calls, as well as for variable references.

Instruction Mnemonic — The (incomprehensibly) understandable version of what is passed to the processor, for reference.

Operand — This one is in terms of labels, or

however the programmer sees it to express it.

At the bottom of the listing is a list of all the labels used, in alphabetical order, with their addresses in hex. Anyway, the only part of the listing we are really interested in is the right most three or four (depending on output and upturning) columns, which contain the actual code as written by the programmer. This portion is the most stable between different assemblers (no, not different processors, but different Oregon assembler programs), although there may be slight differences in the assembler directives — see later.

The best place to start explaining is probably at the top of the listing. The first two lines, along with the last line, produce no actual code for the processor, and are the aforementioned assembler directives. The second line positions the code at address 20000 in memory, and there will probably be a line very similar to this at the

4000		10	TRINTP	DIR	4400
4C10		07		ORG	20000
4C20	06 0F	70		LDA	B'1
4C30	06 00	40		LDA	#120
4C4	06 0400	50	LOOP1	LDY	#POINTR
4E7	30 05	60		LEAX	5'X
4C29	A7 04	70	LOOP2	STR	1'X
4E30	30 0820	80		LEAX	30'X
4E3E	00 0000	90		CHPX	#4000
4E4	25 F6	100		BLO	LOOP2
4E5	106E #100	110		LDY	#400
4E67	01 1F	120	PAUSE	LDH	1'Y
4E69	26 F1	130		BNE	PAUSE
4E70	00	140		DECB	
4E7C	2C 06	150		BGE	LOOP1
4E7E	0F	160		CLPB	
4E8	26 00	170		LDA	#06
4E41	0C 0400	180	LOOP3	LDX	#POINTR
4E44	30 05	190		LEAX	B'X
4E4C	A7 04	200	LOOP4	STR	1'X
4E48	30 0820	210		LEAX	3C'X
4E4F	0C 0500	220		CHPX	#4000
4E4E	05 F6	230		BLO	LOOP4
4E50	107E 0100	240		LDH	#400
4E54	1 1F	250	DELAY	LEH	1'Y
4E56	26 FC	260		BNE	DELAY
4E58	7C	270		INCB	
4E5D	01 20	280		CHPB	#32
4E5E	25 E4	290		BLO	LOOP3
4E5D	30	300		RTS	
4E5E		310		END	20000

DELH =4E54 LOOP1 =4E24 LOOP2 =4E29
 LOOP3 =4E41 LOOP4 =4E46
 PAUSE =4E37 POINTR=4400

start of every program. The last line is an equate, and simply means that all references to the word `POINTR` (see lines 52 and 180) within the program are replaced by the number 5400. The 5400 is the start of the last column in memory. This serves to make the program easier to read and modify. The last line marks the end of the program and makes the execution address 20000. In this case, the execution address is the same as the start address, but this does not always have to be the case.

Op-code

And on to the main code. As we have already described the registers, we'll assume a degree of familiarity with them, but will try to give an understanding of the words `Operand` and `Op-code`.

Line 50 brings us upon, at first, our first Op-code. It is `LOB` which stands for `LOAD REGISTER B` (`Load B`, difficult to hear) and then the Operand `#31`. If it means "the number" if the command needs `LOB 31` it would mean "Load the B register with the contents of location 31." The `#` tells the assembler that it actually means "Load the B register with the number 31." This is very important. The reason that we are loading B with 31 is that we do not need a memory address to be "Offset" (the label used on the flowchart) as we have register B space. (The chances of being able to do this in a big program are about as great as the chances of Gender delivering punctually.)

Line 60 equates an easy one to work out: it means "Load register A with the number (#) 128." op-code is `LDA` (`Load A`) operand is `#128` (the number 128). 128 is the screen code for a black square. If we store this number in memory locations that correspond to screen positions (the screen begins at 5400 (1024), the contents of `POINTR` as defined by the earlier `SDU` command) and ends at 5999 (1023), a black square will appear there.

Line 50 introduces us to our first label — `LOOP1`! pretty simple this, it marks the first place we will loop back to — and they told you machine code was hard! The Operand `Load A` with 5400, which is what the number `POINTR` is equal to. If the command were `LDA POINTR` (ie. without the `#`), A would be loaded with the contents of memory location 5400. Following?

Line 60 `LEAX B X` — this is not so easy to explain so we'll gloss over it until we cover the uses of the X and Y registers in a later article. It basically (ie. at this program) adds the contents of register B to the contents of register X. The reason for this vagueness is that `LEAX` is a complex command with many different uses (Op-code `LEAX` Operand B X).

Line 70 the second loop (thus labelled `LOOP2`) introduces us to another op-code `STA` which quite logically stands for "Store the contents of register A." Thus `STA X` means "Store the contents of register A in the memory location pointed to by X. The `op` on the first run the number 128 (contents of A) will be stored at location 5400 + 31 (the contents of X) which is the end of the top line on the screen. This is the action line.

Line 80 adds 32 to the X coordinate using the `LEAX` command. X only is earlier only with a number instead of a register. Note that there is no need for a `#` in this case. This command can be signed, as to take 32 from X we need only write `LEAX 32 X`.

Line 90 introduces `CMPE`. As you might guess this means "Compare X with" (thus case X is being compared with the address at the bottom of the screen for obvious reasons (if you have understood the flow chart). Op-code `CMPE` Operand 49500) 49500 `CMPE 5400` would compare X with the contents of memory location 5400 as described earlier.

Line 100 introduces a `BRANCH` command. The branch commands will be covered in an article dedicated to them next month. For now, the command means "branch if Lower than operand of last compare instruction." Thus, if X is lower than 5400, the routing loops.

Line 110 Load register Y with 400. Line 120 Called place as this is a loop designed before the program begins so that the effect is reusable. This is achieved by decrementing the Y register (previously

loaded with 400), and using another branch (Line 130, `BNE`) to go back and do it again if the result is non-zero.

Line 140 `DECR` B, subtracts one from the contents of the B register.

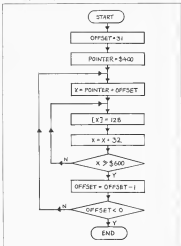
Line 150 "Branch if Greater than or Equal to" back to the setting up of the X register. This instruction controls the movement across the screen.

Line 160 Clear B register. Equivalent to `LOB #0`. This is to set the offset for the next line back across the screen, which is performed by the code in line 170/180, in much the same way as the previous part.

Line 300 Return from subroutine. Returns control the routine that called the code.

Well that about rounds it up for the month, so goodbye, although as a few months will present a series of 5000 memories and their meanings over two articles in various tables for reference.

Next month we will present a complete explanation of all the assembler directives in full coverage of addressing modes and base numbering and a tutorial on the branch instructions.



2358	33C881FAFF1F788C1F78	=	438	2359	FD1F8828E134828FF81	=	482
235A	182788ACD348FF1F788C	=	358	235B	84F7827F8188FF8384F2	=	868
235C	1F78182788AC13C88C8F8	=	38E	235C	84F78888FF788888CFF	=	808
235E	FF1F788C1F7818278888	=	38D	235D	2318888888C3418C8CFF2	=	9C1
235F	9348FF1F788C1F781827	=	2E8	235E	FF78881F788C84E47FFF	=	248
2362	888733C881FAFF1F788C	=	478	235F	28581F788C84E448288	=	47E
236C	1F78182788AC344FF1F	=	784	2361	18AF7888888888888812	=	844
236E	288C1F7818278888C3C8	=	288	236E	FF888C888888E1177FF88	=	844
2368	F888FF1F788F1F788E18	=	81E	2368	8E1888888888F118C2888	=	42D
236A	888F888F318888C1A888	=	48E	236C	A8818FF78887888FAC88	=	887
2364	848FA7888A7881FA788C8F	=	528	236C	3FA7888FA78887FA78888	=	488
236E	A7888FA7888FA7888888F	=	588	236D	8FA788888F8C113328E1	=	4C4
2368	A788888F8C113328E118	=	438	2368	8E1F7888888F888C8848	=	438
23D2	8EFFFF313F788C8E1F88	=	588	23D8	FF88884F5288888884E4F	=	33E
23DC	17888888FF8E88881781	=	38E	23E4	8848FF884833888884848	=	281
23DE	78887888888417818E8E	=	30F	23EE	54881888888888F318C88	=	388
23F8	18888888A7888C1E888F	=	37E	23F8	A888888FA7888A7881FF	=	348
23FA	F88E1F888F1F78888888F	=	488	23FC	888FA78888FA7888FA788	=	5D3
2484	888C8418288888438888F	=	431	248C	888FA788888F8C11F28	=	38F
248E	888C84188888888878E18	=	38C	2418	E18C888888813388888884	=	444
2418	888C84327888888888888	=	83D	241E	814E182788888888F8788	=	3E4
2422	788F881888FFFF178888	=	4FD	242A	4C4C28444F4E4C388814E	=	28D
242C	178188884188888888888	=	28A	2434	4F5448453388887414D45	=	28C
2438	17817481888F1F788F1F	=	78D	243E	788888884F58884E2888	=	288
2448	3888888F8818888888888	=	388	2448	887288888888888888888	=	888
244A	888F8C178881178888884	=	41E	2452	888888888888888888888	=	881
2454	888888888888817818888	=	381	245C	A88888888888888888888	=	4C8
245E	888F1F788F1F78888888F	=	3D3	2468	F8888888888FA7888888	=	473
2468	8818288F188C1F7888188	=	31F	2478	1178F8888888888888888	=	488
2472	18288F188C13488878123	=	3D3	247E	888888888888888888888	=	588
247C	18288F1448884F88888841	=	318	2484	888418888FA788888888	=	488
2488	4E2784288474F788844848	=	288	248E	888888888888888888888	=	48A
2498	88882138888F888C88881	=	488	2498	888888888888888888888	=	413
248F	8F7888888888888888888	=	438	249C	888888888888888888888	=	571
2494	FF78881888F8FF788888	=	48C	249C	A788888888888888888888	=	48D
249E	A88888888888888888888	=	38D	249E	842188884288888888888	=	348
2488	A88888888888888888888	=	3E3	2498	843888888888888888888	=	438
24C2	842888188888888888888	=	488	249F	843888888888888888888	=	48C
24CC	FA1888888888888888888	=	848	24D4	848788818E84881888888	=	48D
24D8	888888818888888888888	=	42E	24DE	843888888888888888888	=	444
24E8	AF378881CF378181CF27	=	3F1	24E8	888888151182788888132	=	78D
24E4	1881FF378181888888888	=	488	24F2	1827888C8818818278812	=	18F
24F4	A8A878818188888888888	=	54A	24FC	888188888888888888888	=	24F
24FE	C888171888888888888888	=	8C1	2488	881888888888888888888	=	38D
2588	288818888888888888888	=	548	2418	884A288F8888888888888	=	418
2512	8888F8188888888888888	=	52E	241A	881FF8888888888888888	=	3D8
251C	C184288F84C8184788F84	=	91A	2424	878881A888888888888888	=	38C
252E	18881F888888888888888	=	382	242C	F8C888888888888888888	=	3F1
2538	1818FF881E378F888C84	=	3D3	2438	881F3484E8A88F7884A88	=	43E
253A	188E184A88C1F88C13882	=	342	243C	F88888888888888888888	=	41E
2544	188C88888888888888888	=	3D3	244C	888888888888888888888	=	88E
254E	7888F8D1F888888888888	=	443	2458	A88888888888888888888	=	488

Category	Item	Unit	Price	Quantity	Total	Notes
Fruit	Apple	kg	1.20	50	60.00	
	Banana	kg	0.80	30	24.00	
	Orange	kg	1.50	20	30.00	
	Pineapple	kg	2.00	10	20.00	
	Watermelon	kg	1.00	40	40.00	
	Grape	kg	2.50	15	37.50	
	Mango	kg	1.80	25	45.00	
	Peach	kg	2.20	12	26.40	
	Plum	kg	1.60	18	28.80	
	Strawberry	kg	3.00	10	30.00	
Vegetable	Cucumber	kg	0.50	60	30.00	
	Eggplant	kg	0.80	30	24.00	
	Broccoli	kg	1.20	20	24.00	
	Carrot	kg	0.60	40	24.00	
	Spinach	kg	1.00	30	30.00	
	Tomato	kg	0.70	50	35.00	
	Pepper	kg	1.50	15	22.50	
	Onion	kg	0.40	70	28.00	
	Potato	kg	0.90	30	27.00	
	Garlic	kg	1.10	20	22.00	
Meat	Chicken	kg	12.00	5	60.00	
	Pork	kg	10.00	3	30.00	
	Beef	kg	15.00	2	30.00	
	Lamb	kg	18.00	1	18.00	
	Duck	kg	8.00	4	32.00	
	Goat	kg	20.00	1	20.00	
	Turkey	kg	14.00	2	28.00	
	Ham	kg	16.00	1	16.00	
	Salmon	kg	22.00	1	22.00	
	Trout	kg	18.00	1	18.00	
Dairy	Milk	l	1.00	10	10.00	
	Cheese	kg	12.00	2	24.00	
	Butter	kg	15.00	1	15.00	
	Yogurt	l	2.00	5	10.00	
	Ice cream	kg	8.00	1	8.00	
	Whipped cream	kg	10.00	1	10.00	
	Cottage cheese	kg	6.00	1	6.00	
	Condensed milk	l	4.00	2	8.00	
	Evaporated milk	l	3.00	2	6.00	
	Sterilized milk	l	1.50	5	7.50	
Bakery	Bread	kg	2.00	10	20.00	
	Cake	kg	5.00	2	10.00	
	Pie	kg	4.00	2	8.00	
	Croissant	kg	3.00	5	15.00	
	Muffin	kg	2.50	8	20.00	
	Cookie	kg	1.50	10	15.00	
	Donut	kg	2.00	5	10.00	
	Pastries	kg	3.50	3	10.50	
	Biscuits	kg	1.80	8	14.40	
	Cupcake	kg	2.20	5	9.90	
Beverage	Tea	kg	5.00	2	10.00	
	Coffee	kg	8.00	1	8.00	
	Juice	l	3.00	5	15.00	
	Soda	l	2.00	5	10.00	
	Smoothie	l	4.00	3	12.00	
	Energy drink	l	3.50	3	10.50	
	Alcohol	l	12.00	1	12.00	
	Wine	l	15.00	1	15.00	
	Beer	l	4.00	3	12.00	
	Soft drink	l	2.50	4	10.00	

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Taking Control

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Functions

The program is called by EXEC3000 and will display its option list. The available functions are: Alter memory, Examine memory, Fill memory, Copy memory, Display memory as jobs list, Check memory works, Register information, Set Breakpoints, Goto breakpoints, Jump to machine code, Goto a machine code subroutine, and Return to Basic. Back is called by pressing the appropriate key. All addresses used by the program must be given in hexadecimal (Four digits: 0000-FFFF).

<A>—Alter memory from 0000. After pressing the <A> enter a two-byte address from which you wish to start altering the memory contents. The screen then clears to display four columns of information. The first is the memory address; the second the value stored at that address; the third the character given when the value is printed to the screen; and the fourth is the character given when the value is posted to the screen. The post and page characters are not always the same. For example, PRINT C=POKE gives a blank, whilst POKE C=0 to the screen produces an inverse @. The display will show several memory locations above and below the location to be changed. The memory location to be altered is indicated by the flashing cursor and can be changed by pressing the up or down arrowkeys. To alter the value stored just type in the value. To return to the option card press the <Break> key. The routine card is demarcated by two empty lines. The Basic program is CLEAR 3000-30000. Then EXEC the Monitor and select the <A>-for memory routine. Give either 1000 or 4000 as the start address (depending on whether or not you have a disc drive attached). The screen

should clear to show the Basic program listed down the columns. Now change the values stored from 3000-30000 to 3020 302000 and then press the <Break> key. Quit the monitor and let the Basic program Run enough it has changed to 10 CLEAR3000 30000.

<E>—Examine memory from 0000. Again the program requires a two byte address (0000-FFFF) and then clears to display the information. The screen is divided into rows of blocks of eight locations. Pressing the up or down arrow will scroll through the memory one line at a time, whilst pressing <Shift> at the same time will move a whole page. Pressing the <Enter> key will switch between displaying the information as ASCII characters or as numbers, whilst pressing the <Break> key will cause the routine if you call this routine and enter 0000 as the start address, you can page through the Monitor program. It will probably be pretty meaningless as numbers, but if you press the <Enter> key, it will be displayed as text, and then you will be able to find the location of the monitor messages stored in memory.

A very similar function is provided by the <F>-fill screen routine. When an address is entered, the computer will display the memory as text POKE to the text screen. As mentioned above, printed characters are not always the same as posted characters.

Memory

The memory can be scrolled by pressing any of the arrow keys. Using the <Shift> and up/down arrow will scroll the memory through one screen page (1612 bytes). Pressing the <Enter> key will print the address of the top left byte of the screen display, and then wait for key press before continuing. Press <Break> to return to the Option screen.

<C>—Fill memory from 0000 to YYYY with ZZ. This routine, as implied, fills blocks of memory with a value (between 00 and FF) in their returns to the menu screen. This is easily demarcated by first entering some graphics memory (POKE400,0) and then filling from 1000 to 3000 with any number from 00 to FF. This can then be checked up on either by the monitor or by displaying the graphics memory itself (PRINT400,SCREEN1,0 EXEC401004). One use of this routine is to fill an area of memory above a machine code program with the value 0F. This is the code for a Software Interrupt (see below), and if a runaway program jumps into this area, it will be redirected to the monitor routine.

****—Copy memory from 0000-YYYY to 2000. Following, this routine copies a block of memory from one location to another. It is a sort of the PCOPY command for the graphics pages, but will work with any block of memory. It requires the start and end address of the source block, but only the start address of the destination. Once done, the program returns to the menu.

<M>—Memory check from 0000 to YYYY. This routine is used to check if the computer memory is working properly. It works by way from the start address to the end, poking every possible number to each address as it goes. It then checks to see whether each location has stored each number properly before moving onto the next address. If a location does not store a number properly, for example the program POKEs a two, but the location stores a seven, it treats one of two things. Either the memory location is defective, or it is not RAM but ROM, and its contents are meant to be permanent (ROM usually 0-65536 and above). If the routine finds a defective memory location it prints a "bad" message and waits for a key press before

```
10 'HEX LOADER FOR DRAGON MONITOR.
20 'BY PETER WHITTAKER.
30 INPUT "START ADDRESS",START
40 INPUT "FINISH ADDRESS",FINISH
50 FOR N=START TO FINISH STEP 8
60 PRINT N;" "
70 TT=8:[INPUT AB,Z=8]
80 FOR M=1 TO LEN(AB)/STEP2
90 L=VAL("00"+M*INSTR(AB,"0"))
100 TT=TT+L:POKE N+Z,L
110 Z=Z+1:NEXT M
120 PRINT " "
130 INPUT T
140 IF T<0 THEN PRINT"error - ENT
    ER L THE AGAIN." GOTO60
150 NEXT N
```

Listing One

returning to the menu. Otherwise the program waits through the end address displaying a "Paused" message all the way, and then waits for a key press before returning to the menu. To demonstrate this routine enter the hexes 0000 0000 and the routine will respond immediately with a 0000 FAIL message that is located address 0000 a part of the Basic ROM and not RAM. Try again and use addresses 0400-0400. This is the top line of the test screen, and you will see the memory being tested as the routine runs. A little lower down the screen you will see the current address and a PASS message. However, if you were to enter 0400-0500 as the block, although the memory would pass almost as soon as the test reached the part of the screen where the ADDRESS PASS/FAIL message is printed, the memory would fail the test. This is not due to the memory being defective, but because the program is changing the memory contents to print the message. So if you get a memory failed message, it does not always mean that the memory is not working properly, but a third thing — it is already being used by something else.

Control

It is with the <C> or Breakpoint command that we move from the world of the interesting to the uninteresting. As mentioned above, machine code does not have any of the safeguards of Basic to stop programs from running out of control. This routine can help to overcome that problem. When this routine is called, it will swap the byte in the address entered for a Software Interrupt (SWI) instruction. This byte is placed in a store in a table for later restoration. When the machine code is then run, it will execute as normal, until it encounters the SWI, where the program is interrupted. All 68000 registers are stored in the "stack" and control is redirected via the interrupt vector to the Register information routine (see below). The program can set up to ten breakpoints and have the address displayed on the register information screen.

Pressing the <X> clears all the breakpoints set using the function. The previously inserted SWI commands are restored by the original code, and the program returns to the menu. SWI commands placed using the <C>-d command or the <A>-R memory routine are not affected.

The register information screen called by the SWI command can also be accessed by pressing the <R> key. The screen will then take the contents of all the 68000 registers (G0-A7,SP,PC,SR,US,PC). When called from the menu directly, they do not reveal very much about what the computer is doing, but when called by a SWI command they give the exact place of the computer as it was before it stayed the interrupt. This enables one to check out whether or not a piece of code is working in state the way it should. Pressing the <C> key will return the computer to continue from where it had got to. (Make sure that you are returning it to the start of a SWI instruction as the inserted SWI command

replaces one byte of the machine code, whilst some instructions are three bytes long.) Pressing the <C> key will set the alter register routine, whilst any other key will return the program to the Option screen. If the alter mode is selected, a flashing cursor waits to say down the registers, and you must type in the desired values for each. The value entered into the Program Counter is the address to which the computer will transfer control. However, before the computer quits the routine it will wait for the <Enter> key to be pressed. Any other key will be ignored (don't forget the register routine again. This is in case you enter the wrong value into the register).

Routine

By a careful combination of this register routine and the setting of breakpoints, pieces of machine code can be tested with the least of them going out of control. To demonstrate this, POLIARS inside EXEC the Monitor. Select the <A>-R memory routine, and using 0000 as the start address, and enter the machine code for Listing #2 (second column from the left). Out the routine by pressing <Enter>, and then <A>-R up to the code at 0000. As the code runs, it will come across the SWI command, and be redirected to the register information routine. Here we can observe

the status of the registers. Press <G> to continue, and see if you can follow the machine code to the results displayed on the screen the next time it is displayed. Once you understand what it is doing, try experimenting with it. Press the <C> key and enter some values into the register. Make sure that the Condition Code register is set to a valid value, and that the program counter is set to return to the routine.

The test two functions are called by the <A>-R and <C>-R keys, and use the jump to a piece of machine code and Go to a machine code subroutine. The first will leave the monitor program, and follow wherever the machine code should lead it, whilst the second will also follow the machine code, but return to the monitor when it reaches the end.

To escape from the program press the <Break> key and the computer will return to its normal functioning. (However, the interrupts and breakpoints will not be reset, so, for example, if you set a breakpoint at location 0000, the computer will return to the monitor every time you try to quit it.)

If you do not fancy typing in the program, I am willing to supply copies on tape, for £2.50. I will also provide a version compiled to reside in high memory rather than on the previous pages. Send a cheque to Peter Whitham, 72 Monmouth Street, Cardbridge CB2 1ND.

MACHINE CODE LISTING

7501	11	PST
1500	20	ORC #1000
1500 4F	70	ESTART C RA
1501 5F	30	CLAB
1502 000000	30	LOK #0
1505 1000 0000	70	LOK #0
1506 0001	40	BLDP ARA #1
1508 0002	40	SUBB #2
1509 3000	40	LEAK A K
150A 3127	40	LOK 3127
1511 30	40	SUB
1512 701000	50	END BLDP
1515	60	END ESTART

3000	00007700 00070000	7502	3040	4F0011 0000140000	006
3000	07010000 00000000	7503	3050	1100100000 140000	001
3000	00000000 00070000	7504	3060	11700000 40000100	002
3100	04001100 00000000	7505	3070	00000011 14000100	000
3110	00000000 00070000	7506	3080	00140000 00070000	001
3120	00000000 00070000	7507	3090	07114000 07000000	001
3130	01001000 00070000	7508	30A0	00000011 00000000	001
3140	00000000 00070000	7509	30B0	00000011 00000000	001
3150	00000000 00070000	7510	30C0	00000011 00000000	001
3160	00000000 00070000	7511	30D0	00000011 00000000	001
3170	00000000 00070000	7512	30E0	00000011 00000000	001
3180	00000000 00070000	7513	30F0	00000011 00000000	001
3190	00000000 00070000	7514	3100	00000011 00000000	001
3200	00000000 00070000	7515	3110	00000011 00000000	001
3210	00000000 00070000	7516	3120	00000011 00000000	001
3220	00000000 00070000	7517	3130	00000011 00000000	001
3230	00000000 00070000	7518	3140	00000011 00000000	001
3240	00000000 00070000	7519	3150	00000011 00000000	001
3250	00000000 00070000	7520	3160	00000011 00000000	001
3260	00000000 00070000	7521	3170	00000011 00000000	001
3270	00000000 00070000	7522	3180	00000011 00000000	001
3280	00000000 00070000	7523	3190	00000011 00000000	001
3290	00000000 00070000	7524	3200	00000011 00000000	001
3300	00000000 00070000	7525	3210	00000011 00000000	001
3310	00000000 00070000	7526	3220	00000011 00000000	001
3320	00000000 00070000	7527	3230	00000011 00000000	001
3330	00000000 00070000	7528	3240	00000011 00000000	001
3340	00000000 00070000	7529	3250	00000011 00000000	001
3350	00000000 00070000	7530	3260	00000011 00000000	001
3360	00000000 00070000	7531	3270	00000011 00000000	001
3370	00000000 00070000	7532	3280	00000011 00000000	001
3380	00000000 00070000	7533	3290	00000011 00000000	001
3390	00000000 00070000	7534	3300	00000011 00000000	001
3400	00000000 00070000	7535	3310	00000011 00000000	001

Listing Two

Pure Speculation!

This year's Budget gave a boost to small investors — so Brian Cudge was asked to take stock of Sharebox

IF YOU are already an investor in stocks and shares, or are just thinking of entering the world of "Capital Gains, Dividends and Forecasts" then Sharebox from Harris Micro Software is worth taking a look at.

Sharebox is a share management program which will help you keep on top of all your holdings of stocks and shares, helping to analyse their performance over the year. As well as most of Harris's software, Sharebox uses their own custom 48x24 screen and keyboard driver. The character set has been improved and now gives a noticeably cleaner looking text. The keyboard driver includes autotape and a disabled break key. The key repeat rate can be altered by the user, as can the background colour of the text screen (although the default settings seem to be ideal).

The share management software actually consists of two programs: Sharebox and Sharebox There can be run individually or called from each other. Sharebox deals with the creation of files and their maintenance, while Sharebox is used for the creation of all reports.

Both programs are menu-form fill driven and include some limited error checking. This consists mainly of testing three input types: numeric, date and alphabetic. There is also some checking of numeric values at key points of input, although one point I found irritating was that the program will not accept 3/2/88 as a valid date. 03/02/88 must be used.

Screen

The screen is divided into three sections: the top line displays the option heading, program name, and date type of the input required (eg NUM for numeric) and the bottom line is used for option selection error and help messages. The main section of the screen is used for the menu forms and reports. When entering data the cursor keys can be used to edit the current field, or move to the next or previous field. Shift-down arrow gives a line of "help" at the bottom of the screen, which usually consists of an explanation of the data type required, and shift-up arrow returns to the main menu immediately (for editing/correction errors).

After an initial sign-on message, Sharebox presents a main menu screen consisting of nine options. The first option (0) is used must be either "Create new file" or "Open existing file". Up to 99 separate files of various lengths can be opened on each disk (providing there is enough disk space). Each file is selected by its file number, and optional password. A filename is also given, but is not the actual filename given to the disk file.

Each share record is identified by a "short name" of up to eight characters, used to sort and retrieve the records. For example, "Uniforce" could be used as a short name for "United News". When retrieving a record, once a match is found for a short name, the user is allowed to browse the record, continue the search or look at the preceding or next record. If no match is found then the "insert" is offered.

Records

When the share record is held for full name, security code, group number, subscription points (up to 4), estimated yield per cent, purchase price, current price, number of shares held, capital gains, tax credits and dividends. The share price may be quoted in pounds or pence (up to a maximum of 999.99 in pence). There are 30 group numbers, covering most types of shares. The group number can be used with the short name for selection of particular records within the reports program. Any field of a share record can be changed at a later date (apart from the short name) either by directly selecting the "change record" option, or automatically from within other options.

Sharebox handles 12 "periods" of time, keeping the prices of the shares for each record for each period. Once the 12th period is started, the price of shares in the first is lost and so on. This information is updated within the reports program. The length of time between one period and the next is entirely up to the user, and need not be the same for each period.

Once all the initial data has been entered, it is a simple matter of keeping the data up to

date with share prices for the current period, and any buying or selling you do. One of the problems with Sharebox appears when you intend the option to buy some more shares. A share record already holds one purchase price, and one value for the number of shares held. However, you will hope that daily buy more shares at a later date, and at a different price. Harris suggests that users use different share records for different "ventures" of share purchases, and although this will work, it seems a bit of an annoying fudge.

The problem also affects the "Sell Shares" option. This asks for the number of shares to be sold and the selling price. From this it calculates the capital gain made by the sale. This will be accurate if the shares sold were bought at a different price from the original purchase price. The program gives you the opportunity to type in the correct capital gain if that calculated is incorrect. The share record is then updated with the new holding and capital gain for the year. The user is allowed to start a new year at any time, and so zero the current values of dividend, capital gains and tax credits.

Dividends received are entered by selecting option six. The program prompts for the income received and the tax credit. This information is then added into the particular share record.

All reports from the share management system are produced by the other program on the disk, Sharebox There are six different reports that the program can produce for each file. The data to be included in a report can be selected by range of short name, and by range of group number. Some reports also allow selection by range of period or months. All reports

SHAREBOX	Postings	Program	NUM
MAIN OPTIONS			

0	...	CREATE NEW FILE	
1	...	OPEN EXISTING FILE	
2	...	BUY SHARES	
3	...	CHANGE SHARE RECORD	
4	...	SELL SHARES	
5	...	RECEIVING DIVIDEND	
6	...	CHANGE SHARE PRICES	
7	...	RUN REPORTS PROGRAM	
8	...	END PROGRAM	

TYPE CHOICE (1-9) <0>

can be sent either to the screen or printer, output to printer being generally more detailed, taking advantage of the full 80 columns and be substantially pagged for 11 paper. One limitation is that only one file may be accessed at once (there is no cross-referencing to other files).

Basically, the different reports provided for are as follows: Firstly there is the 'List Share Valuation' option. This produces a report on the valuation of shares, for two different periods, and the profit or loss resulting. The benefit values for the two periods are the original purchase price (period 0) and the current price (period 1).

The 'List Capital Gains' option shows all share records which contain capital gains or losses (ie during the current year). The 'List Dividends Received' option shows all the dividends and tax credits received to date in the current year, and calculates the yield percentage (the dividends as a percentage of the holding at the current price).

A potentially useful report is the 'List Income Forecaster'. This will show all the shares which are expected to pay dividends within the range of income selected and will estimate the dividend received.

Price changes in shares over a period of time can be shown with the last option. The default for this period is from the original purchase to the current price. The report shows the start price, end price and the percentage change.

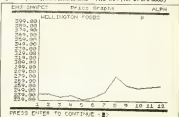
The final report allows a graph to be drawn of the price changes of particular shares over the 12 periods. This gives a

visual indication of their performance. If the screen is selected then a simple line graph is drawn, or a printer the graph is drawn using 'ASCII characters. Because of the vast differences in share prices, different scales are used on different graphs: therefore one has to be careful when comparing output for different shares to take into account the scale.

Overall, Sharebox functioned extremely well under all tests. The displays are clear and well laid out and the data structure seems sensible. The 30 page As manual is up to Home usual high standard explaining each step clearly, with a useful contents

page at the beginning. Apart from the fairly minor problem of having to have different 'integers' of shares, I would happily recommend Sharebox. The program deserves to do well, but just how large a market there is for software such as this on the Dragon remains to be seen.

Program: Sharebox Share Management Program. Requires: Dragon 32/64 and Dragonbox/Gemini Dcs 2.0 and optional printer. Price: £15.00. From: Harry Micro Software, 40 Altonville Road, Newcastle, Middlesex, TW9 4HP. (Tel. 01-570 6635.)



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Micro Computer Software & Accessories

Talking Port

I AM building a speech synthesizer from my Dragon 32 for use in conjunction with the cartridge port. What I need to know is how to send and receive data via the port, or what memory addresses to use. I would also like to know how to output the sound input on pin 26 (SND) to the television.

I have tried to find the answer in many Dragon related books, but none of them even touch on the subject of the cartridge port.

Dean Campbell
60 Southern Wy east
North Hasting
Sussex
DN20 3LA

THE full 8088 address bus is brought out to the cartridge port, so the addresses you need depend entirely on your cartridge address decoding. To maintain compatibility you should arrange for I/O to be at 0000 (SND).

Cartridge sound is selected by clearing bit 5 of \$FFFF and setting bit 3 of \$FFFF and bit 3 of \$F720. The signal applied to pin 26 should be suitable for feeding directly into the sound multi-plier.

New Command

IN JANUARY 1988 Dragon User I have just read that there are three variable routines (GOSAVE, GOSAVE2 and GOSAVE3) but there is no variable routine for checking for quotes on the command line (e.g. "COPY" "intro"). What is the routine for checking for variables for the quotes?

Also, is it possible to change existing Basic commands to your own commands, or NEW to NEW?

Michael Clark
161 Woodland Road
Hemel Hempstead
Herts
LU2 7AP

IF YOU just want to check for a quote character, then the routine you need is CQUOTE at address 26364. The 8 register should contain 24 as entry.

More likely, you need the routine GQUOTE at address 26404,



which will deal with the string variable, whether to quote or as a variable name. See the Firmware notes for details on this routine.

It is possible to change the Basic commands to your own. To do this you must copy the ROM's command name and address tables down into RAM and alter the pointers of 26820 and 26821 accordingly. You can now POKE into the name table to change command names to anything possible, with the constraint that the length of the command must remain the same.

Monitor

RECENTLY I purchased a Green Monitor for my Dragon 32 computer, but it seems that this monitor is not fully compatible with the Dragon.

The problem is that the quality of the picture reproduced on the screen, especially when the Dragon is in the text mode, is such that it appears to flicker rapidly, but only when I turn it down with the contrast control. Can I easily read any fairly substantial on the screen? A friend of mine suggested that it should take the contrast off its housing in order to improve the quality of picture because it is, he said, which is causing all the interference.

Michael Savage
38 Linton St
Stroma
Glasgow

SEVERAL problems could be causing the symptoms you describe with the monitor. Firstly the Dragon's monitor output has an impedance of 370 ohms, and some monitors require 75 ohms. A suitable load can solve this problem.

Another cause of flickering is the main frequency, which must be compatible with both the computer and monitor. Is the display synchronized? However the Dragon's display is more particularly good when fed into a game screen monitor unless the text is centered — flicker might occur just down not down to work very well.

I certainly would not recommend avoiding the video chip, as it seems unlikely that this could cause the problem, and in the case you should seek expert advice before interfering with the chip, or you could end up with no display at all.

Recover

I OWN a Dragon 32 and would like to be able to recover Basic programs after using the command NAME I have used POKE 2530 and POKE 2630 as I have been told that memory locations 25 and 26 hold the BASIC programs.

So far I have only been able to recover just some of the old programs. I don't know the correct names to use these locations, but I have been told you tell me the right names or tell me how to recover my programs any other way within Basic.

Michael Dagnall
Oxford
Oxfordshire
Oxford

BASIC programs can be recovered provided that you have not entered any program lines starting with POKE. Type in the following line as a direct command and wait for the OK prompt to appear (this may take several minutes for a long program).
FOR I=POKE(2530+POKE(2630)+1) TO 2530, IF POKE(I)=POKE(I)+1

— D. Toller NEXT

Next type the following again as a direct command:
I=I-3 POKE 27 (INT(2544)/POKE 26 I=POKE(27)+254

The program should now be restored, and can be listed.

Disks

I HAVE just recently purchased a Compaq Disk Drive and DOS. What I want to know is will the QDOS disks you can buy from software companies work on the Compaq Disk system, as I am not sure and I don't want to buy any disks until I know the answer.

Michael Holloway
3 The Street
Chichester
Sussex
South PO19 1AB

COMPAQ Disk 3.0 uses the standard format and commands as QDOS version 1.0, and is compatible with most programs. I see most programs, as I have had a chance to study the Compaq ROM in detail. Basic programs should be no problem, but my best advice would be to check before entering a program.

Routine

I AM currently writing a database program for the Dragon 32 and QDOS disks. I want to be able to access the disk 320 after machine reset, but I have no idea how to go about this. Could you please write a small routine to demonstrate how to use the disk ROM?

Simon Lock

THE EXTRA 320 of RAM is present between 26768 and 65536 by writing to address \$FFFF. The ROM's can be re-selected by writing to \$FFFF. When accessing the extra RAM with Basic/Doc running, it is necessary to disable interrupts as these would cause the program to crash when the ROM's are disabled.

You could incorporate the routine below into your own program. This will return the byte at address 0 in RAM to the A register. A similar routine can be written to store a byte at address 0 by replacing the LDA with STA.
BRCC \$F200
STB \$F200
LDA \$F
STB \$F200
ORCC \$F0
RTS



MIKE GERRARDS ADVENTURE TRAIL

ONE OF the steps toward the task of new adventure releases for the Dragon is, of course, for people to start writing their own. I do receive home-grown adventures quite often, and though I always respect the amount of hard work that goes into creating them, this usually does have to be paid back with a letter of criticism, as I can't give space in the column to an adventure that isn't fully debugged and that I can't recommend other readers to buy.

Just occasionally, however, one comes along that is a little bit special and I'm glad to draw people's attention to it. This last was one called *The Winds of Whistled* arrived several months ago, and which has now been published by Quicksilver Software. It's being a longer look at that real night, but this month I'm happy to recommend an adventure called *Space: One Year later* by L. Edwards, who is decided to call himself Moonshot. He told me the adventure took him about 30 hours of programming time and about 10 hours of preparation time, and it's a preparation which shows. A lot of thought has gone into this game, and it shows that you can still come up with something different if you set your mind to it. Although I'd like to see the title changed to something a little less obvious.

The first part of the program loads in the optional instructions and mission briefing, and though the cassette plays weren't ready with my review copy, it is good to know that the provisions may well be quite detailed and the instructions on screen are quite informative and also make you write to Moonshot for help if stuck (well, it makes my life easier).

Mission

The scenario might just sound vaguely familiar to you, that is the fifth campaign, the Endeavour, was launched in 2012 in order to find the previous four, all gone missing. Only two months after the launch (the one week most of the crew had taken off with something nasty called *Rigorous Fever*).

The only known cure is an alien-derived toxin (Nylaxyl, which you don't happen to have in your medicine cupboard) right now. Now do you have the drilling equipment you'll need to produce a perfect and pure antibiotic? Fortunately Nylaxyl has been located on the planet Holberg by your superior Officer Mr. Selvon, who sounds like something you buy at the chemist to get on chapped lips. You've got permission

from Starbase HQ to land on Holberg, as ever to you (the Adventure Player).

The easiest thing about this adventure, for a Dragon game of any race, is that you actually control four characters. You're given a menu screen initially inviting you to choose the one you start off with, but in playing the game if you type **MENU** as a command, you can switch to one of the other characters. As happens at Five Holes of Alton on the Spectrum, Amstrad and other machines, only certain characters can perform certain tasks. So if you're having no luck with one, try asking another to do it. The instructions say that only Selvon can handle the sensors, and I can't wait to encounter someone who wants worth reprogramming.

Characters

The characters all start in different places, and the response time as you switch between them is very quick indeed. Captain Christopher James, for instance, begins in the command seat with a row of labelled switches in front of him. He can use the Captain's Com Unit and exits going North and East. On console, the game is that the screen displays outside with flying up. "EDIT GO IN 5" doesn't look very good, and neither does the title being printed at the end of the first location description.

Back to the Com Unit, however. If you examine it you see it has five buttons: three to summon the other main crew members, one to activate a security guard and one to switch the microphone off. You might want to summon one of the other members to help you out with a task you're finding tricky in your current location, to go ahead the appropriate button and your location description is updated so that you can also see the second character. Switch to them to try solving the problem, and naturally they can also see the first character in their location description. Very cool work.

With James in the command seat, Selvon is the Scientific Officer's main job. Engineer Harishh McCordle is in the engineering section and Spinks is in the laboratory (don't panic, he isn't too far away). So the first reason for enjoying the adventure is that it's a team game to play, you're finding that you're actually in a spaceship. The location descriptions are only used, but there are plenty of them

interconnecting nicely, and with other characters in different parts of the ship this is all very effective.

You'll need your mapping skills and use of paper, because there are at least six levels of the ship, with a lift to take you between them. Spinks starts in the first floor and you're on the bridge, with exits leading East, West and South back to the lift. There are exits in all directions if you emerge on Level Two (the work box), Level Three (a corridor) or Level Six (the transporter room). The other two levels take you to the engineering section and the shuttlecraft. In addition to that, though, and all the locations that are on each level, you can also climb between floors using the service ladders. I found such a hatch on Level Four went through it and up a ladder, crossed over and climbed down a service vent and then I was on Level Three, where I had a brief encounter in the loading room.

I can't tell you much about the problems myself because I've been spending my time trying to map out this spaceship, just making a note of where various objects like tools and protective clothing are. There is a SAVE option, and apart from the screen layout and a vocabulary that could be understood a bit, I think this is an excellent adventure. I've no doubt that in a healthier climate for Dragon software, the author would have found a larger software house to publish it, but this duplicated copies himself and they're available for £4 from Broomfield, 30 Broomfield, Wakeley Garden City, Herts AL7 1HF. Worth every penny, and I hope to be looking at *Space: One Year later* soon.

One thought that occurs to me, and which I throw out to any interprising software houses that might be making comparisons are the thing at the moment, and a company called Quicksilver has just published a four-part set of Spectrum adventures that have already been released but rather neglected, which is excellent value at £7.95. Why not the same for Dragon adventures? There's plenty of good material out there, some of it no longer easily available and known from the size of my mailing every month that there is still a large potential market. How about it, someone?

Devoting all that space to one new adventure means I'll have to try to cram everything else into the next few columns. A lot of readers needing help so

maybe you can pitch it and tell them what it is! can't. This is a hell way thing, remember, so if you've ever received it due from anyone, send whether you can do the same for another adventure!

Richard Reed 37 Edgeworth Drive, Fallowfield, Manchester M14 6PU having trouble getting into the yellow goal in *El Diablo*? Try another colour! **Richard**

S Goodwin 48 Albany Road, Euxine Coventry CV5 6LU asks about Salamander adventures he was trying to track down. *Franklin* in *Wonderland* and *White Cliffs of Dover*. A few copies of the former are around, but the newer copy I received of the latter responded with an "Out of Memory" error when loaded. I doubt it finished copies were made available as it was at the time when Salamanders were cutting back on dragon releases. Anyone seen one? This reader also thinks he's solved *Jonathan Adventure*, but having found treasures he's got nowhere to put them (he sometimes places) and can't score more than 10/100. Over to you.

Julian Blair wondered anyone can let him have a copy of the instructions for *Dragon Delay Adventure* (which he bought at the First AGO Show. All he's done so far is stand in an arena and get killed. Any help to Julian at Howells Cottage, Froxy Street, Ruper, West Sussex BN12 4QA

G Ashhurst of 49 Fosseway, Syston Leicesters LE17 8AF offers help on *Dragon Muggers* but is stuck in *Sea Quest* how to get the scuba gear, and if you need a credit card then where is it? **WOD WOD** HOTT ESQUO HOCKEY AND WODDY WOKA BRIDGE at

I have to pay to you Mr Ashhurst (Steven Farr of 12 Preston Court on the wonderfully named Lumburbs Estate Northampton NN3 4HD is playing Quixote position and having no luck getting into places like the hot shaft and poppadee. Looking at my maze I think it's just a case of typing ENTER. Games if that's wrong perhaps some reader would put Steven right, if only for the pleasure of addressing an envelope to the Lumburbs Estate.

M Nicholls 10 Western Way Bolton 38 Yarncliffe North M40N 6WY wants to ride the bridge in *Outlander* escape security robots in *Lost in Space* and enter slot in *Mountains of Air* (Dennis Deanevan, 20 St Johns Road, Rawley Park, Stafford ST17 5AS, in *Black Sarcophagi*, what to do with Jon the Bishop's ghost gives you, and what not to do the woman?

Gary Coggins 86 Penington, Glascoed Heath Tarnworth, Staffs. various problems on *El Diablo* and wants a gain in *Marathon of Doom*. *Richard Heath* just wants to see his new lights (in *Dragon Unleashed*), but also needs help in several places in *Thelander* and *Jonathan* and wants to know where to buy *Sea Quest*. *Steven* gave *Colossus Island* and *Black Sarcophagi* in a word, **Richard** HETSAMHOUTT Sorry can't get out of the habit. Touchmaster that's Unit 5, Beglen Industrial Park, Baglan Port Talbot, West Glamorgan SA62 7DU. Telephone (01631) Perry 820319. Richard's at 85 Newcastle Road, Leek, Staffs.

And I'm at the end of the column, isn't it clever the way it always finishes at the bottom of the page. I don't know how we do it.

Adventure Contact

To help puzzled adventurers further, we are instituting an Adventure Helpline - simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to *Dragon User Adventure Help*.

Adventure
Problem

Name
Address

line 12/13 Little Newport Street, London WC2H 7PP. As soon as enough letters have arrived we will start posting them in the magazine.

Don't worry - you'll still have *Adventure Trail* to write to about!

May 88

Adventure Contact

Adventure Jonathan

Problem How can I get to the castle? What do I do with the map and the internet screen? How do I get the sword without dying? **Name** Stuart Charnock **Address** 13

Haycombe, Dursland, Island Road, Dorset DT11 0PE

Adventure Jonathan

Problem How can I get to the castle? What do I do with the map and the internet screen? How do I get the sword without dying? **Name** Ian Greenough **Address** 110 Albert Street, Bolton, Greater Manchester M41 4AB

Adventure Jonathan

Problem How do I use the sword and how do I open the sword? **Name** Paul Marlow **Address** 80 Little Avenue, Bantley, Woking, West Sussex GU24 5JP

Adventure Jonathan

Problem I have reached the castle but have been in many rooms, cannot get out. **Name** Hywel Perkin **Address** 13 Thomas Street, Treforest, Newport, Gwent

Adventure Jonathan

Problem How can I get to the castle? What do I do with the map and the internet screen? How do I get the sword without dying? **Name** Peter Jones **Address** 13

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The Numbers Game

Gordon Lee makes a connection between cornflakes and maths — with 20 Blahy games at stake!

LAST MONTH I concluded with a question of probability involving three boxes and six marbles. The answer to the question as posed is that you would be most likely to select the ball if events add, as there is only a one in three chance of you winning the ball provided that the colour of the hidden marble is green as being of the same colour as the one that has just been revealed. In this case the ball is really that the box chosen will be one of the two with the coloured marbles as opposed to the chance of selecting the single box with the white marbles. Looked at another way, if the colour there are six marbles — three of each colour. If the revealed marble is red, then the chosen box cannot be the one with the two white marbles, so two white marbles can be removed from the reckoning. This means that all the three marbles that are left behind, only one is white and two are red. Therefore, in this situation always once the colour of the guessed before the marble is removed.

Oddds

When assessing odds at everyday life it comes as no surprise to find that the total winning expectation is usually in direct proportion to the odds. For example, a bet of say one pound on a horse race will have a relatively high chance of success (there are a limited number of horses running a race) but the total amount won will be proportionately small. Conversely the same amount staked on the football pools may net the jackpot but of course the odds against this happening are many many times greater. The actual prediction of the odds in these races is difficult due to external influences but in games such as roulette for example, the winning odds paid are directly related to the probability of the ball winning. Thus the black/red, even/odd higher/lower bet pays off at even, a bet on a single number will win at 35 to 1 if it

wins not for the "zero" compartment on the wheel these would be added as "lost" odds when assessed against the probability involved. However the "zero" (and in American casinos the "double zero") weight the odds in favour of the house (and against the punter).

Mathematical literature is particularly rich in the field of probability paradoxes such as the example quoted last month. Usually the paradox depends on an ambiguous or misleading way of presenting the paradox. For instance I might say that if two dice are thrown a score of 11 can result in only one way — a five and a six — and a score of 12 also in only one way — a double six. From this the probability of each is equally likely. Closer examination will reveal that this is not the case as although of 11 is possible in two ways and notional that is a five and a six, or a six and a five. Therefore there is twice the expectation of throwing an 11 than a 12. The following program illustrates this clearly by displaying all 36 possible scores obtainable with two dice.

```
10 FOR A=1 TO 6: FOR B=1 TO 6:
20 PRINT A,B: NEXT B: NEXT A
A term much used in computing odds and probabilities is 'factorial'. The factorial of a number is the product of all integers up to and including that number. The factorial of six would be  $1 \times 2 \times 3 \times 4 \times 5 \times 6$  or 720. Usually we say 'factorial six' to denote the value. When writing this down the exclamation mark is used, so we would write  $6!$  = 720.
```

Factorials are frequently used for computing the number of different permutations of objects. The competition in the March 1988 issue of Dragon User was to distribute the number of possible arrangements possible with a standard pack of playing cards. Since the top card of the pack can be any one of 52 possible cards the second card any one of the remaining 51 and so on down the pack, the total number of permutations of cards will be

given by $52!$ that is $52 \times 51 \times 50 \times 49 \dots$. The final computation is a staggering 68 digit number.

Perhaps more familiar is the type of competition which, for want of a better name might be called the 'cornflakes' competition, due to the fact that they are frequently to be found on the packets of breakfast cereal. To enter it successfully arrange a list of features (usually meanings the prize on offer) in correct order — or at least the order decided upon by a 'panel of experts'. As an example I there were 12 features, listed the number of possible permutations will be $12!$ — that is $479,001,600$. In other words you would need to submit over 479 million entries to be certain of winning one. Sometimes the competition is made a little easier (only the top eight features need to be listed — that is, the four least important features can be disregarded). In this case the calculation would be $12!/8!$ or 10,958,400, a reduction on the previous value, but still an enormous amount of stamp-collecting to be sure of sending in a winning entry!

Occasionally the actual order need not be specified, a being necessary to only name the eight features in any sequence. This increases our winning chances quite considerably as we can divide the previously computed odds by $8!$ — that is increase eight. The actual number of possibilities will now be $131,681 \times 40$. Now there are only 480 combinations possible.

You should now be well prepared to tackle this month's competition problem. During dissection of the box top step, a key containing 20 primary dice was knotted to the floor.

The dice scattered around, coming to rest with an assortment of faces on top. Can you determine what the odds were of all 20 of the dice coming to rest with the same appearance? For the answer we need to know the exact computation down to the last digit!

Prize

This month we have a treat for all you martial arts fans — 20 copies of the Blahy by King-Po — The Master. This game in the ancient traditions of the Eastern mystic arts, allows you to meditate peacefully on life, the Universe and everything — and then smash the living daylight out of a few Dragon-ponies! All good things for

contestants contacted the program.

Made sure that your name and address are clearly printed on your entry — and don't forget to mark your envelope 'May Competition'. Envelopes without the magic words mysteriously disappear on reaching the Editor's desk.

And cut to a new martian technology! Complete the following phrase in less than 10 words — 'I got a kick out of my Dragon because...'. As usual, preferences will be given to the more creative efforts.

February winners

In February we were giving away a prize galley — and the lucky winners were as follows: Charles Daly of County Cork, Eric, Phyll Roberts of Portonville, Mal Gannon

Jun, Justin Hovell of Hales, Susan, Steven Woodhouse of Boreham, Neil, D. A. Hunt of Carlisle, Lucie M. Ameydood of Basingstoke, Simon Aubrey of Swinton, Wm, Chris Peck and Deborah S. A. Newman of Addlestone, Suzy Jay Sampson of Chesham, Doris, P. J. Taylor of Robert Road, Woodstock, Cleveland, Mrs. Marlene of San Sebastian, Spain, Rachel Edmunds of Salford, Col. Robert P. D. Maddocks of Taplow, Berks, A. Wilson of DFPO 106. Congratulations one and all.

Solution

Finally, for those who still might be struggling with — the answer to the puzzle was — 240345 — 743261 — 512341

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